

**IN THE UNITED STATES PATENT
AND TRADEMARK OFFICE**

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SEPARATOR FOR FLUIDS AND SOLIDS

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1 **I. TITLE: "SEPARATOR FOR FLUIDS AND SOLIDS"**

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3 **II. BACKGROUND OF THE INVENTION**

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5 **1. Field of the Invention.**

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7 The present invention relates to a separator for fluids and solids, and
8 more particularly, to a separator that does not use moving parts.

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10 **2. Other Related Applications.**

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12 The present application is a continuation-in-part of pending U.S.
13 Patent Application Serial No. 09/865,994, filed on May 5, 2001, which is
14 hereby incorporated by reference.

15
16 **3. Description of the Related Art.**

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18 Many designs for treating gases have been designed in the past for
19 the purpose of separating a particular gas from solids or liquids suspended
20 in a physical mixture. The prior art devices use moving parts to avail
21 themselves of the effect of centrifugal forces. Nor are the prior art devices
22 suitable to be used in a continuous system. None of these designs have
23 achieved the degree of success realized in the present invention with a
24 relatively simple structure that is inexpensive to construct and maintain.

25
26 Applicant believes that the closest reference corresponds to U.S.
27 patent No. 2,015,076 issued to Lavigne for a centrifugal separator.
28 However, it differs from the present invention because Lavigne patented

1 invention does not include through openings cooperatively disposed at an
2 angle to facilitate the exit of the solids by defining an entrance adjacent to
3 the outermost wall portion of the conduit member.
4

5 Applicant believes that another of the closest references correspond
6 to U.S. patent No. 4,278,550 issued to Watts for a fluid separator. However,
7 it differs from the present invention because Watts patented invention does
8 not include through openings cooperatively disposed at an angle to
9 facilitate the exit of liquid by defining an entrance adjacent to the conduit's
10 outermost wall portion. The present invention is characterized by having
11 openings at acute (downstream) angle with respect to the direction of flow
12 of the fluid inside the serpentine that facilitate the exit of solids and liquids,
13 respectively. In Watts the openings run at an acute (upstream) angle with
14 respect to the direction of flow of the fluid (figure 3). The most that the
15 particles can do in Watts is clog the entrance to the openings. Therefore,
16 Watts' device is inoperable to separate particles in a fluid. In the present
17 invention, the inwardly extending portion directs the particle towards the
18 opening.
19

20 Another of the closest prior arts know to Applicant corresponds to
21 U.S. patent No. 5,567,321 issued on October 22, 1996 to Weber, Rohr and
22 Suter. The centrifugal filter discloses a rotatable traveling basket including
23 holes and a rather complicated mechanism. However, the patented
24 centrifugal filter uses moving parts and it would not work in a continuous
25 system. Also, it does not work for gases such as those present in exhaust
26 systems.
27

III. SUMMARY OF THE INVENTION

It is one of the main objects of the present invention to provide a separator for fluids and solids that does not use moving parts.

It is another object of this invention to provide a separator for fluids and solids that is easy to install and use, especially with internal combustion engines.

It is still another object of the present invention to provide a separator that does not require power or any source of energy other than the pressure applied by the fluid being processed.

It is yet another object of the present invention to provide a separator that can be used in a continuous system.

It is yet another object of this invention to provide such a device that is inexpensive to manufacture and maintain while retaining its effectiveness.

Further objects of the invention will be brought out in the following part of the specification, wherein detailed description is for the purpose of fully disclosing the invention without placing limitations thereon.

IV. BRIEF DESCRIPTION OF THE DRAWINGS

With the above and other related objects in view, the invention consists in the details of construction and combination of parts as will be more fully understood from the following description, when read in conjunction with the accompanying drawings in which:

Figure 1 represents an isometric view of one of the embodiments with a broken portion showing the interior of its housing for the separator object of the present invention.

Figure 2 shows a cross-sectional view of a wounded conduit's portion, showing the disposition of the through openings.

V. DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, where the present invention is generally referred to with numeral 10, it can be observed that it basically includes housing 20, wound conduit assembly 40, inlet 44 and outlet 46. In operation, a fluid to be processed (typically containing small particles or vaporized liquids in suspension) enters inlet 44 and exits through outlet 46. One of the advantages of this invention is that it lends itself to be used in a continuous system, such as for treating the exhaust gases produced by an internal combustion engine.

As seen in figure 1, housing 20 has a substantial cylindrical shape with a concave bottom 22 including an opening 23 in its lowermost point. Wound conduit assembly 40 is mounted inside housing 20.

Wound conduit assembly 40 includes a serpentine conduit member 42 with outermost wall portion 43. Serpentine conduit member includes inlet 44 and outlet 46. Outermost wall portion 43 has a plurality of through openings 47. In the preferred embodiment, openings 47 are formed at an angle to facilitate the exit of the heavier matter contained in the gas mixture, as best seen in figure 2. . Inwardly extending wall 48 that directs particles outwardly, by the centrifugal force, to enter opening 47. Inwardly extending wall 48 extends at an angle that extends from 15 to 45 degrees with respect to the internal surface of conduit assembly 40. Wall 48 is positioned adjacent and downstream from openings 47. In this manner, fluid or solid particles will be trapped and forced out through openings 47 by the centrifugal force. Once outside, gravity causes it to fall within housing 20 wherein it is collected.

The small particles and/or liquid in suspension form a circular current inside housing 20 after they exit assembly 40. To prevent the small particles or separated liquid in suspension to reenter assembly 40, outwardly extending wall 49 is disposed adjacent and upstream from through openings 47, at an angle between 15 and 45 degrees with respect to the outermost wall portion 43.

The present invention can be implemented with different means for applying a pressure differential between inlet 44 and outlet 46 so that the fluid entering inlet 44 is forced through serpentine conduit member 42 and out through outlet 46. The heavier matter contained in the fluid is forced radially out through openings 47 by the action of the centrifugal forces. In this manner, the resultant fluid that exits through outlet 46 is free of the heavier particles and/or liquids. The pressure differential can be enhanced

1 with the application of a pressurized second fluid (such as air) through
2 inlet 44 that causes the fluid being processed to speed up through member
3 42.

4
5 The centrifugal force acting on the solids or heavier mater suspended
6 in the fluid is represented with the following equation $F = V^2 / R$ where V is
7 the velocity of the fluid and suspended heavier matter and R is the radius
8 of curvature.

9
10 In the embodiment shown in figure 1, the heavier matter passing
11 through openings 47 is collected at bottom 22 passed through 23 for
12 disposal or further processing.

13
14 One of the applications for the present invention is with internal
15 combustion engines. The exhaust gases typically contain particles and oil
16 vapors in suspension. Other industrial applications make also desirable
17 separating solids/liquids from fluids (liquids or gases), such as
18 environmental, pollution control devices and others. Forcing the exhaust
19 gases through serpentine conduit member 42 causes a centrifugal force that
20 is proportional to the square of the to rotational speed at which the exhaust
21 gases are traveling. The higher the pressure differential with respect to
22 outlet 46, the faster the gases will travel and the higher the magnitude of
23 the centrifugal force. Also, the larger the radius of curvature of the wound
24 conduit members, the smaller the centrifugal force.

25
26 Applicant has found that using a coil of 6.4 cm. in diameter for the
27 wound conduit member and with a conduit member having an inner

1 diameter of 1 cm., the pressure provided by typical internal combustion
2 engines has been sufficient to impart the necessary speed to the fluid for
3 the present invention to work.

4
5 Another application would be the use of the invention in polluted
6 areas such as industrial smokestacks. In these applications, the polluted air
7 can be compressed and injected to inlet 44 or alternatively a negative
8 pressure is applied to outlet 46 to suck the polluted air.

9
10 One other possible application contemplates the use of the invention
11 with pressurized gases, such as air, to separate water vapors and other
12 particles.

13
14 Still another application involves a liquid fluid, such as oil, with
15 small solids in suspension. The oil can be engine in transmission oil, for
16 instance. The liquid is forced through inlet 44 in a similar fashion as
17 discussed above.

18
19 The foregoing description conveys the best understanding of the
20 objectives and advantages of the present invention. Different embodiments
21 may be made of the inventive concept of this invention. It is to be
22 understood that all matter disclosed herein is to be interpreted merely as
23 illustrative, and not in a limiting sense.